

---

**Complex hair cycle domain patterns and regenerative hair waves in living rodents.**

**Journal:** J Invest Dermatol

**Publication Year:** 2008

**Authors:** Maksim V Plikus, Cheng-Ming Chuong

**PubMed link:** 18094733

**Funding Grants:** CIRM Stem Cell Biology Training Grant

**Public Summary:**

We hope that the experimental evidence reviewed here will facilitate further recognition of the complexity of the hair cycle in the field of hair research. It can be used as a guide for the planning of hair cycle experiments in adult animals. Simple, yet powerful techniques of monitoring and studying hair cycle patterns, such as whole mount pilo-sebaceous units staining with Oil red, can be easily adopted into any experimental design. We also want to advocate the use of transverse sections through hair cycle domains to capture all stages of hair cycle instead of just one. This method is much more advantageous over having to collect multiple skin samples from different discrete hair cycle stages. Our method allows to observe the continuum of hair cycle stages and not to overlook brief events, such as transient expression of signaling molecules. Furthermore, researchers performing hair cycle studies in transgenic mice should recognize that hair growth pattern dynamics can be dramatically altered in mutant animals.

**Scientific Abstract:**

Single hair follicles go through regeneration and involution cycles. In a population, hair follicles may affect each other during anagen re-entry, thus forming propagating regenerative hair waves. We review these regenerative hair waves and complex hair cycle domains, which were recently reported in transgenic mice. Two non-invasive methods to track the propagating hair wave in large populations of hair follicles in vivo are described. We also reviewed early accounts of "hair growth patterns" from classical literature. We decipher the "behavior rules" that dictate how dynamic hair waves lead to complex hair cycle domains. In general, a single domain expands when a regenerative hair wave reaches a responsive region and boundaries form when the wave reaches a non-responsive region. As mice age, multiple hair cycle domains form, each with its own regeneration rhythm. Domain patterns can be reset by physiological events such as pregnancy and lactation. Longitudinal sections across domains show arrays of follicles in a continuum of hair cycle stages. Hair cycle domains are different from regional specificity domains. Regenerative hair waves are different from the developmental wave of newly forming hair follicles. The study provides insights into the dynamic states of adult skin and physiological regulation of organ regeneration.

---

**Source URL:** <https://www.cirm.ca.gov/about-cirm/publications/complex-hair-cycle-domain-patterns-and-regenerative-hair-waves-living>